HEX INVERTERS WITH OPEN COLLECTOR OUTPUTS

DESCRIPTION
The M74LS05P is a semiconductor integrated circuit containing 6 open collector output inverter circuits.

FEATURES
- Usable in AND-Tie connection.
- High breakdown input voltage ($V_I \geqq 15V$)
- Low power dissipation (P_d = 12mW typical)
- High speed (t_{pd} = 10ns typical)
- Wide operating temperature range (T_a = -20 ~ +75°C)

APPLICATION
General purpose, for use in industrial and consumer equipment.
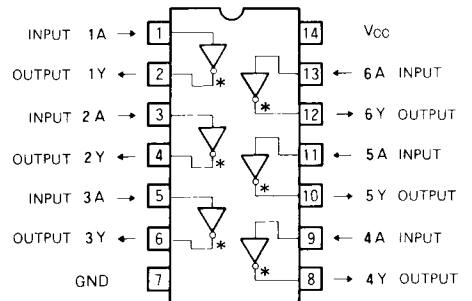
FUNCTIONAL DESCRIPTION
With the use of Schottky barrier diodes for the inputs and open-collector outputs, the high-level output impedance can be selected freely by use of an external load resistor. This permits wire-AND connection, which has been impossible with conventional gates.

When input A is high, output Y is low, and when A is low, Y is high.
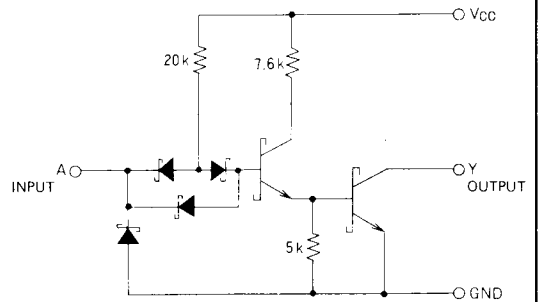
FUNCTION TABLE

A	Y
L	H
H	L

PIN CONFIGURATION (TOP VIEW)

INPUT 1A → 1	14 V_{CC}
OUTPUT 1Y ← 2 *	13 ← 6A INPUT
INPUT 2A → 3	12 → 6Y OUTPUT
OUTPUT 2Y ← 4 *	11 ← 5A INPUT
INPUT 3A → 5	10 → 5Y OUTPUT
OUTPUT 3Y ← 6 *	9 ← 4A INPUT
GND 7	8 → 4Y OUTPUT

*: OPEN COLLECTOR OUTPUT

Outline 14P4

CIRCUIT SCHEMATIC (EACH INVERTER)

20k   7.6k V_{CC}

A INPUT   Y OUTPUT

5k

GND

UNIT : Ω

ABSOLUTE MAXIMUM RATINGS ($T_a = -20 ~ +75°C$, unless otherwise noted)

Symbol	Parameter	Conditions	Limits	Unit
V_{CC}	Supply voltage		-0.5 ~ +7	V
V_I	Input voltage		-0.5 ~ +15	V
V_O	Output voltage	High-level state	-0.5 ~ +7	V
T_{opr}	Operating free-air ambient temperature range		-20 ~ +75	°C
T_{stg}	Storage temperature range		-65 ~ +150	°C

HEX INVERTERS WITH OPEN COLLECTOR OUTPUTS

RECOMMENDED OPERATING CONDITIONS ($T_a = -20 \sim +75°C$, unless otherwise noted)

Symbol	Parameter		Min	Typ	Max	Unit
			Limits			Unit
V_{CC}	Supply voltage		4.75	5	5.25	V
I_{OH}	High-level output current	$V_O = 5.5V$	0		100	μA
I_{OL}	Low-level output current	$V_{OL} \leq 0.4V$	0		4	mA
		$V_{OL} \leq 0.5V$	0		8	mA

ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75°C$, unless otherwise noted)

Symbol	Parameter	Test conditions		Min	Typ*	Max	Unit
				Limits			Unit
V_{IH}	High-level input voltage			2			V
V_{IL}	Low-level input voltage					0.8	V
V_{IC}	Input clamp voltage	$V_{CC} = 4.75V$, $I_{IC} = -18mA$				-1.5	V
I_{OH}	High-level output current	$V_{CC} = 4.75V$, $V_I = 0.8V$, $V_O = 5.5V$				100	μA
V_{OL}	Low-level output voltage	$V_{CC} = 4.75V$	$I_{OL} = 4mA$		0.25	0.4	V
		$V_I = 2V$	$I_{OL} = 8mA$		0.35	0.5	V
I_{IH}	High-level input current	$V_{CC} = 5.25V$, $V_I = 2.7V$				20	μA
		$V_{CC} = 5.25V$, $V_I = 10V$				0.1	mA
I_{IL}	Low-level input current	$V_{CC} = 5.25V$, $V_I = 0.4V$				-0.4	mA
I_{CCH}	Supply current, all outputs high	$V_{CC} = 5.25V$, $V_I = 0V$			1.2	2.4	mA
I_{CCL}	Supply current, all outputs low	$V_{CC} = 5.25V$, $V_I = $ open			3.6	6.6	mA

* : All typical values are at $V_{CC} = 5V$, $Ta = 25°C$.

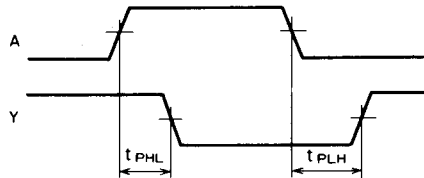## SWITCHING CHARACTERISTICS ($V_{CC} = 5V$, $Ta = 25°C$, unless otherwise noted)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
			Limits			Unit
t_{PLH}	Low-to-high-level output propagation time	$R_L = 2 k\Omega$		10	32	ns
t_{PHL}	High-to-low-level output propagation time	$C_L = 15pF$ (Note 1)		10	28	ns

Note 1: Measurement circuit

TIMING DIAGRAM (Reference level = 1.3V)
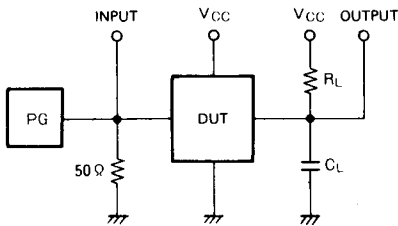
(1) The pulse generator (PG) has the following characteristics:
PRR = 1MHz, t_r = 6ns, t_f = 6ns, t_w = 500ns,
$V_P = 3V_{P-P}$, $Z_O = 50\Omega$
(2) C_L includes probe and jig capacitance.

TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm

$19^{+0.5}_{-0.2}$

6.3 ± 0.15

7.62 ± 0.3

4.5 MAX

0.5 MIN 3 MIN

$0.27^{+0.07}_{-0.05}$

2.54 ± 0.25

0.5 ± 0.1

$1.5^{+0.3}_{-0.1}$

7.6 ~ 10
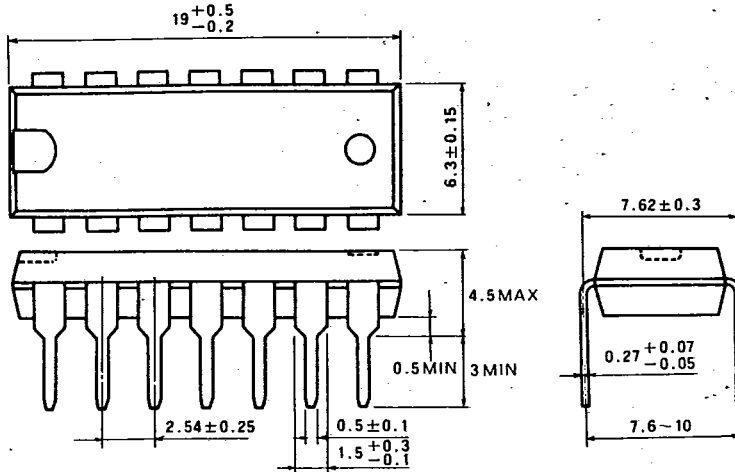
TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm

$19^{+0.5}_{-0.2}$

6.3 ± 0.15

7.62 ± 0.3

4.5 MAX

0.5 MIN 3 MIN

$0.27^{+0.07}_{-0.05}$

2.54 ± 0.25

0.5 ± 0.1

$1^{+0.3}_{-0.1}$

$1.5^{+0.3}_{-0.1}$

7.6 ~ 10
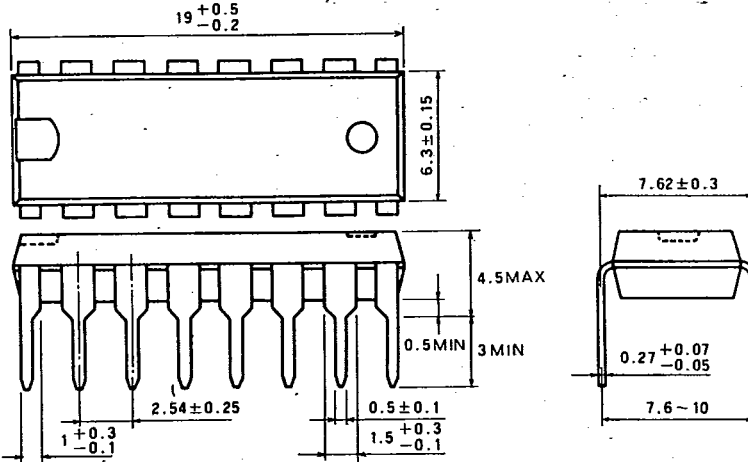
TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm

$24^{+0.5}_{-0.2}$

6.3 ± 0.15

7.62 ± 0.3

4.5 MAX

0.5 MIN 3 MIN

$0.27^{+0.07}_{-0.05}$

2.54 ± 0.25

0.5 ± 0.1

$1.5^{+0.3}_{-0.1}$

$1^{+0.3}_{-0.1}$

7.6 ~ 10